APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR		ATTORNEY DOCKET NO.
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EXAMINER
STEVENS,G

ART UNIT	PAPER NUMBER
2411	

DATE MAILED: 04/09/97

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

☒ Responsive to communication(s) filed on *Jan 23, 1997* _____ .

☒ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire _____ *3* _____ month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

☒ Claim(s) *1-20* _____ is/are pending in the application.

    Of the above, claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) *1-20* _____ is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

    ☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

        ☐ received.

        ☐ received in Application No. (Series Code/Serial Number) _____ .

        ☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

    *Certified copies not received: _____ .

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☐ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

Part III DETAILED ACTION

1.   **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time

policy as set forth in 37 C.F.R. § 1.136(a).

> A SHORTENED STATUTORY PERIOD FOR RESPONSE TO THIS
> FINAL ACTION IS SET TO EXPIRE THREE MONTHS FROM THE
> DATE OF THIS ACTION. IN THE EVENT A FIRST RESPONSE IS
> FILED WITHIN TWO MONTHS OF THE MAILING DATE OF THIS
> FINAL ACTION AND THE ADVISORY ACTION IS NOT MAILED
> UNTIL AFTER THE END OF THE THREE-MONTH SHORTENED
> STATUTORY PERIOD, THEN THE SHORTENED STATUTORY
> PERIOD WILL EXPIRE ON THE DATE THE ADVISORY ACTION IS
> MAILED, AND ANY EXTENSION FEE PURSUANT TO 37 C.F.R.
> § 1.136(a) WILL BE CALCULATED FROM THE MAILING DATE OF
> THE ADVISORY ACTION. IN NO EVENT WILL THE STATUTORY
> PERIOD FOR RESPONSE EXPIRE LATER THAN SIX MONTHS
> FROM THE DATE OF THIS FINAL ACTION.

2.   **Response to Applicant's Remarks**

The applicant has traversed the first office action in this case on two fundamental

grounds. First, as asserted on page 9 in the applicant's response received February 6,

1997, neither Syswerda nor Tanaka teach scheduling a task that uses consumable

resources. Second, as asserted on page 12 in the applicant's response, Tanaka teaches

constraint relaxation which is not the same as constraint repair as claimed. The examiner

respectfully disagrees on both issues.

Regarding the first issue both Syswerda and Tanaka are scheduling systems used

in factory environments. Both systems allocate resources to tasks. In a factory, both

reusable and consumable resources are applied to tasks in order to create a product.

Syswerda specifically discusses the allocation of resources to tasks (See Syswerda; col. 4, lines 12-19). The applicant asserts that Syswerda only deals with reusable resources and cites col. 4, lines 26-28 as support. However, the passage cited was an example of what is referred to by Syswerda as a hard constraint violation. Namely, a single task could only use a single given resource at any given time and any violation would be considered a violation of a hard constraint and therefore not permitted. The Syswerda invention teaches the use of both hard and soft constraints with the distinction being that hard constraints may not be violated and soft constraints may be. Otherwise, the user may specify anything as being a hard or soft constraint and the examiner asserts that this includes both reusable and consumable. As an example, the user of the Syswerda system may specify that inventory may not drop below a certain point and that this can be designated either a hard constraint or a soft constraint by the user. For example, if inventory may be easily and quickly replenished then this may be a soft constraint and relaxing the constraint using the Tanaka invention would be possible. On the other hand, if lead time for a part is long, then this could be designated a hard constraint.

Regarding the assertion that Tanaka does not teach the use of consumable resources, the applicant supplies an example (Page 9 of the response) of power consumption used by the factory as a reusable resource. The examiner asserts that power is generally considered a consumable resource which may be replenished like any consumable resource.

Regarding the applicant's second issue (page 12 of the response), the applicant argues that the constraint relaxation method of Tanaka is not the same as the constraint repair method as claimed. When examining claims the examiner is required to give the claims "the broadest reasonable interpretation consistent with the specification." *In re Prater*, 1396, 415 F.2d 1393, 1405, 162 USPQ 541, 551 (1969). In the instant case, the claims call for repairing constraint violations. As stated by the applicant on page 12 of the response, constraint repair "generally" does not widen a solution space as constraint relaxation does. However, as the statement implies, on occasion a constraint violation may be repaired by constraint relaxation. Therefore, giving the claims the broadest reasonable interpretation, constraint violations may be repaired by constraint relaxation and the claims as presently drafted read upon Tanaka.

Based on the above analysis the examiner finds the applicant's arguments to be unpersuasive.

3.   STATUTORY BASIS FOR 35 U.S.C. 103 OBVIOUSNESS REJECTION

The following is a quotation of 35 U.S.C. § 103 which forms the basis for all obviousness rejections set forth in this Office action:

> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

> Patentability shall not be negatived by the manner in which the invention was made.
> Subject matter developed by another person, which qualifies as prior art only under subsection (f) or (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

4.   Claims 1-20 are rejected as unpatentable under 35 U.S.C. 103 over Syswerda in view of Tanaka.

5.   Regarding claim 1, Syswerda teaches of a method for scheduling an activity (See Syswerda, Abstract) that uses consumable resources (See Syswerda; column 4, lines 12-19) and is governed by a set of predefined constraints (See Syswerda; abstract; column 1 line 68 through column 2, line 4). An initial schedule is created through the random assignment of tasks (See Syswerda; column 2, lines 39-40). The schedule is then evaluated and scored in order to obtain a ranking (See Syswerda; column 2, lines 42-45). Through the use of crossover and mutation operators new schedules are generated (See Syswerda; column 4, lines 59-63). Legal schedules are created that meet all hard constraints and scoring is accomplished using weighted values for soft constraints (See Syswerda; column 2, lines 26-28). Schedules that are scored highly have a higher likelihood of being chosen for participation in the operation than a relatively low scoring schedule. However, random selection is also used to ensure complete evaluation of the decision space (See Syswerda; column 4, line 68 through column 5, line 5). The process

is repeated and a listing of ranked schedules is generated from highest to lowest (See Syswerda; claim 1).

Syswerda does not teach of repairing constraint violations. All hard constraints are strictly meet to generate legal schedules. The evaluation of the soft constraints and whether they are violated along with their associated weights are used to establish scores for each schedule.

Tanaka teaches of selectively relaxing violated constraints in order to generate a legal schedule (See Tanaka, abstract). The examiner respectively asserts that constraint relaxation is one method of constraint violation repair which would fall within the boundaries of the claims as presently drafted.

The motivation to modify the teachings of the primary reference, Syswerda, with that of the secondary reference, Tanaka, comes directly from the secondary reference. In the real world of manufacturing, not all constraints need to always be strictly satisfied. in a production scheduling problem. On a factory floor, machine usage is normally flexible to some extent, and can be changed more or less depending on conditions. In this manner, in an actual constraint satisfaction problem, constraints can be relaxed to widen a "solution space" or "a set of candidate solutions". In this manner the probability of finding an optimal production schedule is increased and the commensurate savings due to increased efficiency is realized.

6.   As per claim 2, Syswerda teaches that schedules which are scored highly have a

higher likelihood of being chosen for participation in the operation than a relatively low

scoring schedule (See Syswerda; column 4, line 68 through column 5, line 5).

7.   As per claim 3, schedules which score highly have a better chance of making the

list.   However, random selection is also used to ensure complete evaluation of the

decision space (See Syswerda; column 4, line 68 through column 5, line 5).   The

examiner asserts that this would cause the worst scoring schedule to occasionally be

selected for list inclusion.

8.   As per claim 4, Syswerda does not per se select the last schedule as the final

schedule which in the present application would be the highest scored schedule.

However, Syswerda does supply an ordered list of schedules in ranked order. It would

have been obvious to one of ordinary skill in the art to select the highest ranked schedule

as the final schedule.   Otherwise, a less than optimum schedule would be used to

produce a product.

9.   As per claims 5 and 13, Syswerda does not teach storing the best scoring

schedule or the list of ranked schedules. The examiner asserts that it is well known in

the art to store the results of computations.   The motivation to do so is to allow for later

retrieval and review.

10.   As per claim 6, Syswerda teaches that tasks and their associated constraints are

given different priorities.   When a task is placed into the schedule but it has a soft

constraint violation then only half of its priority is added to the schedules score (See Syswerda; column 4, lines 34-49). The degree of violation of the constraint is not addressed by Syswerda. However, Tanaka teaches that constraints may be relaxed to enable the creation of a legal schedule. To accomplish this Tanaka use a knowledge base to determine the possibility and degree of relaxation possible (See Tanaka; column 3, lines 1-6).

The motivation to modify the primary reference with the teachings of the secondary reference has been previously supplied under claim 1 and is incorporated her by reference.

11.   As per claim 7, Syswerda teaches that tasks and their associated constraints are given different priorities. When a task is placed into the schedule but it has a soft constraint violation then only half of its priority is added to the schedules score (See Syswerda; column 4, lines 34-49). The degree of violation of the constraint is not addressed by Syswerda. However, Tanaka teaches that constraints may be relaxed to enable the creation of a legal schedule. To accomplish this Tanaka use a knowledge base to determine the possibility and degree of relaxation possible (See Tanaka; column 3, lines 1-6).

The motivation to modify the primary reference with the teachings of the secondary reference has been previously supplied under claim 1 and is incorporated her by reference.

12.   Regarding claim 8, Syswerda does not teach of repairing constraint violations. Tanaka teaches of selectively relaxing violated constraints in order to generate a legal schedule (See Tanaka, abstract). The examiner respectively asserts that constraint relaxation is one method of constraint violation repair which would fall within the boundaries of the claims as presently drafted. After relaxation under the Tanaka invention the constraint violation would be less severe since there would probably be no constraint violation.

The applicant is directed to claim 1 for the motivation to modify the teachings of the primary with the teachings of the secondary reference.

13.   Regarding claim 9, neither Syswerda nor Tanaka teach of requiring a schedule to surpass a predetermined threshold score. However, Syswerda supplies a ranked listing of scored schedules and the examiner asserts that the user may select any schedule form the list which exceeds a threshold score.

14.   Regarding claims 10, 11, 17 and 18, neither Syswerda nor Tanaka teach that resources are inventory or materials used in maintenance and repair operations. However, Syswerda teaches that resources may be selected from a predetermined pool of resources (See Syswerda; column 4, lines 12-19). The examiner asserts that inventory and parts used for maintenance and repair are resources which can be retrieved from a pool of resources (See Syswerda; column 1, lines 62-66).

15. As per claim 12, Syswerda teaches of a method for scheduling an activity (See Syswerda, Abstract) that is governed by a set of predefined constraints (See Syswerda; abstract; column 1 line 68 through column 2, line 4). An initial schedule is created through the random assignment of tasks (See Syswerda; column 2, lines 39-40). The schedule is then evaluated and scored in order to obtain a ranking (See Syswerda; column 2, lines 42-45). The scoring function is accomplished by evaluating tasks accomplished and the constraints violated (See Syswerda; column 4, lines 33-49). All constraints have descriptive information stored identifying them as either soft or hard constraints (See Syswerda; column 2, lines 23-29). Through the use of crossover and mutation operators new schedules are generated (See Syswerda; column 4, lines 59-63). Legal schedules are created that meet all hard constraints and scoring is accomplished using weighted values for soft constraints (See Syswerda; column 2, lines 26-28). Schedules that are scored highly have a higher likelihood of being chosen for participation in the operation than a relatively low scoring schedule. However, random selection is also used to ensure complete evaluation of the decision space (See Syswerda; column 4, line 68 through column 5, line 5). The process is repeated and a listing of ranked schedules is generated from highest to lowest (See Syswerda; claim 1).

Syswerda does not teach of repairing constraint violations and thereby generating new schedules for comparison to earlier generated schedules scores.

Tanaka teaches of selectively relaxing violated constraints in order to generate a legal schedule (See Tanaka, abstract). The examiner respectively asserts that constraint relaxation is one method of constraint violation repair which would fall within the boundaries of the claims as presently drafted.

The applicant is directed to claim 1 for the motivation for modifying the teachings of the primary reference with that of the secondary reference.

16.   As per claim 14, all constraints have descriptive information stored identifying them as either soft or hard constraints (See Syswerda; column 2, lines 23-29). Tasks and their associated constraints are weighted through a priority function (See Syswerda; column 4, lines 1-5).

Syswerda does not teach of providing descriptions of constraints or repairing constraints using a method specific to the constraint.

Tanaka teaches that each constraint has an associated knowledge source which indicates whether the constraint may be relaxed and the degree by which it is relaxed. In addition, when such information is absent then the system may turn to an external source (See Tanaka; column 3, lines 1-12). The examiner asserts that it would be necessary to identify in a descriptive manner the constraint to the external source for the external source to be able to supply information on relaxing the constraint.

The applicant is directed to claim 1 for the motivation for modifying the teachings of the primary reference with that of the secondary reference.

17.   As per claims 15 and 16, the examiner asserts that the use of an input device and display are well known in the art.

18.   As per claim 19, Syswerda teaches that hard and soft constraints may include reusable resource constraints (See Syswerda; col. 4, lines 25-28).

19.   Claim 20 is similar to claim 1 and the applicant is directed to claim 1 for the reasoning behind the rejection of this claim.

20.   The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

21.   Any Inquiry concerning this communication or earlier communications from the examiner should be directed to George N. Stevens whose telephone number is (703) 308-7563 from 7:00 A.M. to 4:00 P.M. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gail Hayes, can be reached at (703) 305-9711. The fax number for this group is (703) 308-5357.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group Receptionist whose telephone number is (703) 305-3900.

GNS: April 1, 1997

ROBERT A. WEINHARDT
PRIMARY EXAMINER
GROUP 2400